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Interactive comment on "A new approach to estimate ice dynamic rates using satellite observations in East Antarctica" *by* Bianca Kallenberg et al.

Anonymous Referee #1

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General Comment

Kallenberg et al report on a new approach for estimating ice dynamic rates for mass balance assessment from EO data and apply this for a study site in East Antarctica where an increase in ice mass has been observed in recent years. In the approach the ice dynamic are estimated by combining modelled SMB rates with gravity observations from GRACE and laser altimetry observations from ICESat. The derived IDR is combined with modelled elevation changes due to snow processes for comparison with measured elevation changes from ICESat. The authors find the estimated ice dynamic rates from GRACE and ICESat of similar magnitude and modelled elevation changes in correlation with direct altimetry observations. This is a well written, illustrated and

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Discussion paper

referenced methodological manuscript and a valuable and original contribution for the glaciology community. I would suggest a few minor corrections/clarifications to help improve the manuscript.

Specific Comments

Pg2 – Ln 20-23: There appears to be a mix up here. Ice velocity is derived from satellite radar interferometry and related methods in the mentioned studies, not from altimetry.

Pg5 – Ln 12-17: Studies have shown that leakage from oceanic geophysical signals may bias mass rate estimates for Antarctica from GRACE significantly. How is this quantified or dealt with in the approach?

Grammar, punctuation & style

Pg6 – Ln12: trend due to SMB

Pg7 – Ln24: Eq. 7 & Eq. 9 do not exist, I assume Eq. 4 & Eq. 5 are meant

Pg13 – Ln4: Ligtenberg et al.

Pg13 – Ln18: Eq. A3

Pg15 – Ln5&Ln11: Equation (A7)

Pg15 – Ln25: (Appendix A2)

Pg16 – Ln14: I assume Eq. 1 is meant here

Pg16 – Ln15: I assume Eq. A3 is meant here

Figures

Fig. 1: Invert color scale

Fig. 2: What is the white cross in Fig. 2a

Fig. 2: Y-axis label: dM/dt in mm or mm/yr?

Fig. 3: (m yr-1): please check scale here

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